



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/750,128	12/29/2000	Dong Kyu Kim	Q61480	6801

7590 04/13/2004
SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, DC 20037-3213

EXAMINER	
TON, ANTHONY T	
ART UNIT	PAPER NUMBER

2661

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/750,128

Applicant(s)

KIM, DONG KYU

Examiner

Anthony T Ton

Art Unit

2661

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18 and 36-39 is/are allowed.
- 6) ☒ Claim(s) 1,2,7,8,12-17,19,21,28,29,31-35 and 40 is/are rejected.
- 7) ☒ Claim(s) 3-6,9-11,20,22-27 and 30 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 June 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Drawings

1. The drawing is objected to because of the following informalities:

New corrected drawings are required in this application because **hand drawing** for **Figs. 2, 3, 7a, 7b, 9 and 10** is informal. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Objections

2. **Claims 11 and 30** are objected to because of the following informalities:

Expression " $\wedge + c + i, a$ " in line 2 of the **claims 11 and 30** is not appropriate since the character " \wedge " is not complied with the equation (9) listed in the specification.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1, 13, 14, 19, 21, 31, 32, 34, 35 and 40** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Raphaelli et al** (US Patent No. **6,614,864**) in

view of **Lee** (US Patent No. **6,373,861**), and further in view of **Sudo et al** (US Patent No. **6,714,511**).

a) **In Regarding to Claim 1: Raphaeli et al disclosed** a system for estimating frequency offset in an orthogonal frequency-division multiplexing (OFDM) system, comprising:

a sliding window correlation summing device that receives an input and generates a sliding window correlation sum in accordance with a reference symbol (*see Fig.2A: block 12; see col.10 lines 32-33: a predetermined number of symbols; and see col.11 lines 42-65: match the expected symbols in a valid preamble (hence a reference symbol))*); and

Raphaeli failed to explicitly disclose a frequency offset estimator that is coupled to said sliding window correlation summing device and receives and processes said sliding window correlation sum to calculate a frequency offset estimation. **However, Raphaeli explicitly disclosed** a template adaptation function device that is coupled to such a sliding window correlation summing device and receives and processes said sliding window correlation sum for synchronization (*see Fig.2A: block 22*). Hence, **it would be obvious** on this subject matter of the instant claim.

Lee disclosed such a frequency offset estimator (*see Fig.5: block 190 (in which the devices inside block 190 are used to process a fine frequency offset synchronization; and blocks 164 and 166 acts as a sliding window device coupled to the frequency offset estimator 190))*).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide such a frequency offset estimator throughout said template adaptation function device of Raphaeli et al, as taught by Lee, so that a synchronization can be achieved in OFDM systems, **the motivation being** to provide enhancing efficiency in Raphaeli et al's communication receiver.

In addition, Raphaeli failed to explicitly disclose wherein said reference symbol comprises an analytic tone located in only one subchannel of said reference symbol. **However, Sudo explicitly disclosed** such a reference symbol (see col.2 line 20 – col.3 line 30: *In a general frame format, a pilot symbol (an analytic tone), a known reference signal, is added before a message interval. In a general coherent detection method, a fading variation is detected using a pilot symbol (see col.2 lines 26-30)*).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide such a reference symbol comprises an analytic tone located in only one subchannel of said reference symbol throughout the predetermined symbols of Raphaeli et al, as taught by Sudo et al in order to detect synchronization; **thus, the synchronization being** detected in response to a maximum correlation sum.

b) In Regarding to Claim 13: Raphaeli further disclosed an estimation range of said system can be extended by adjusting a correlation interval between samples (see Fig.6: Correlators #1 and #2 in corresponding to β and α , respectively (hence an estimation range can be extended from β to α)).

It would have been obvious to combine Raphaeli et al, Lee and Sudo et al for the same reason as in Claim 1.

c) In Regarding to Claim 14: Raphaeli further disclosed said analytic tone has at least one of a uniform magnitude and a uniform phase rotation, and no coarse synchronization is required (see col.4 lines 25-40: symbols with a constant fixed rotation).

It would have been obvious to combine Raphaeli et al, Lee and Sudo et al for the same reason as in Claim 1.

d) In Regarding to Claim 19: this claim is rejected for the same reasons as Claim 1 because the apparatus in Claim 1 can be used to practice the method steps of Claim 19.

e) In Regarding to Claim 21: this claim is rejected for the same reasons as Claim 1 because the apparatus in Claim 1 can be used to practice the method steps of Claim 21.

f) In Regarding to Claim 31: this claim is rejected for the same reasons as Claim 13 because the apparatus in Claim 13 can be used to practice the method steps of Claim 31.

g) In Regarding to Claim 32: this claim is rejected for the same reasons as Claim 14 because the apparatus in Claim 14 can be used to practice the method steps of Claim 32.

h) **In Regarding to Claim 34:** **Raphaeli** et al further disclosed changing a maximum estimation range of the estimation is determined in accordance with said number of samples (see col.18 lines 65-67: a specified range).

It would have been obvious to combine **Raphaeli** et al, **Lee** and **Sudo** et al for the same reason as in Claim 1.

i) **In Regarding to Claim 35:** **Raphaeli**, **Lee** and **Sudo** failed to explicitly **disclose** said maximum estimation range is ± 32 subcarrier spacing when **N** has a value equal to 1. **However**, **Raphaeli** disclosed about a specified range for an estimation as discussed in claim 16. **Therefore**, **it would have been obvious** to one of ordinary skill in the art at the time of the invention was made to implement such an estimation, as taught by **the Applicant** to the **Raphaeli** since " ± 32 subcarrier spacing when **N** has a value equal to 1, thus such an estimation is obvious in a design choice, the **motivation being** to synchronize data information throughout a communications network and make **Raphaeli** more efficient and reliable.

j) **In Regarding to Claim 40:** this claim is rejected for the same reasons as Claim 1 because the apparatus in Claim 1 can be used to practice the method steps of Claim 40.

5. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Raphaeli et al** (US Patent No. 6,614,864) and **Lee** (US Patent No. 6,373,861) in view of **Sudo et al** (US Patent No. 6,714,511) as applied to Claim 1 above, and further in view of **Giallowrenzi et al** (US Patent No. 6,332,008).

Raphaeli, Lee and Sudo disclosed all aspects of claim 2 as set forth in Claim 1.

Raphaeli failed to explicitly disclose a timing offset estimator that receives said input and generates said timing offset estimation independent of said frequency offset estimation. However, **Raphaeli disclosed** a shift register device 28, which is used to received input signal and coupled to the sliding window, is configured as a circular shift register; when an α symbol is input to the shift register 28, it is circularly shifted such that after a unit symbol time delay, the symbol in the shift register 28 is a non-rotated symbol (see Fig.2B: block 28; and see col.16 lines 32-34). Hence, it **would be obvious** on this subject matter of the instant claim.

Giallowrenzi et al disclosed such a timing offset estimator (see Fig.2: block 36; wherein the timing offset estimation is independently outputted at the block 70 of the figure).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide such timing offset estimation throughout the shift register 28 of Raphaeli et al, as taught by Giallowrenzi et al so that correct synchronization can be produced to user's receivers in a spread spectrum communications receiver, **the motivation being** to enhance reliability and make Raphaeli et al more efficient.

6. **Claims 2, 7, 8, 12, 15-17 and 33** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Raphaeli et al** (US Patent No. **6,614,864**) and **Lee** (US Patent No.

6,373,861) in view of **Sudo et al** (US Patent No. **6,714,511**) as applied to Claims 1 and 21 above, and further in view of the **Admitted Prior Art (Fig.11)**.

a) **In Regarding to Claim 2: Raphaeli, Lee and Sudo disclosed** all aspects of claim 2 as set forth in Claim 1.

Raphaeli failed to explicitly disclose a timing offset estimator that receives said input and generates said timing offset estimation independent of said frequency offset estimation. However, **Raphaeli disclosed** a shift register device 28, which is used to received input signal and coupled to the sliding window, is configured as a circular shift register; when an α symbol is input to the shift register 28, it is circularly shifted such that after a unit symbol time delay, the symbol in the shift register 28 is a non-rotated symbol (see Fig.2B: block 28; and see col.16 lines 32-34). Hence, **it would be obvious** on this subject matter of the instant claim.

The **Admitted Prior Art showed** such a timing offset estimator (see Fig.11: block 63).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide such timing offset estimation throughout the shift register 28 of Raphaeli et al, as taught by the Admitted Prior Art so that correct synchronization can be produced to user's receivers in a spread spectrum communications receiver, **the motivation being** to enhance reliability and make Raphaeli et al more efficient.

b) **In Regarding to Claim 7: Raphaeli, Lee and Sudo disclosed** all aspects of claim 7 as set forth in Claim 1.

Raphaeli, Lee and Sudo failed to explicitly disclose said sliding window correlation sum comprising:

a first delayer that delays said input signal in accordance with a frequency offset estimation interval to generate a first delayed output; a conjugator that performs a first operation on said first delayed output to generate a conjugated output; and a mixer that mixes said conjugated output and said input signal to generate a mixer output.

However, the **Sudo disclosed** a coherent detector of the OFDM transmission and reception apparatus that is in a similar configuration as that of the Applicant (see Fig.4: block 41, 43 and 42). Hence, **it would be obvious** on these subject matters of the instant claim.

In Fig.11 of the Admitted Prior Art showed all of above subject matters of the instant claim (see Fig.11: blocks 53 (first delay), 55 (conjugator) and 57 (mixer)).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to implement such a sliding window correlation sum throughout the OFDM transmission and reception apparatus of the Sudo, as taught by the Admitted Prior Art, so that correct frequency offset estimation can be achieved in OFDM networks, **the motivation being** to maximize reliability and make Sudo et al more efficient.

c) In Regarding to Claims 8, 15 and 33: Raphaeli, Lee and Sudo disclosed all aspects of claim 8 as set forth in Claims 1 & 7; claim 15 as set forth in Claim 1; and claim 33 as set forth in Claim 21.

Raphaeli, Lee, Sudo and the Admitted Prior Art failed to explicitly disclose said sliding window correlation sum comprising: wherein $(N-a_2)$ samples are generated in a moving sum in accordance with said mixer output, and N represents a total number of subcarriers and a_2 represents a frequency offset estimation interval.

However, the Admitted Prior Art Fig.11 showed a moving sum having $N/2$ samples. The only difference between the instant claim and the Admitted Prior Art is $N/2$ compared to $N-a_2$.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to implement such a moving sum, as taught by the Applicant to the Raphaeli since " $N/2$ " can be equal to " $N-a_2$ " if " a_2 " is equal to " $N/2$ ", thus such a moving sum is obvious in a design choice, **the motivation being** to synchronize data information throughout a communications network and make **Raphaeli** more efficient and reliable.

d) In Regarding to Claim 12: Raphaeli, Lee and Sudo disclosed all aspects of claim 12 as set forth in Claim 1.

Raphaeli, Lee and Sudo failed to explicitly disclose the system further comprising a switch that outputs said frequency offset estimation in accordance with said timing offset estimation.

The Admitted Prior Art showed such a switch (*see Fig.11: the switch at the output of block 61 and a control line connected from Timing offset to such a switch*)

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to implement such a switch of the Raphaeli, as taught

by the Admitted Prior Art, so that correct frequency offset estimation can be achieved in OFDM networks, **the motivation being** to maximize reliability and make Raphaeli et al more efficient.

e) **In Regarding to Claim 16:** Raphaeli et al further disclosed a maximum estimation range of the estimation is determined in accordance with said number of samples (see col.18 lines 65-67: a specified range).

It would have been obvious to combine Raphaeli et al, Lee, Sudo et al and the Admitted Prior Art for the same reason as in Claim 15.

f) **In Regarding to Claim 17:** Raphaeli, Lee, Sudo and the Admitted Prior Art **failed to explicitly disclose** said maximum estimation range is ± 32 subcarrier spacing when N has a value equal to 1. **However, Raphaeli** disclosed about a specified range for a specified estimation as discussed in claim 16 above.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to implement such an estimation, as taught by the Applicant to the Raphaeli since the " ± 32 " is a quantity of a "64" subcarrier spacing when N has a value equal to 1, thus such an estimation is obvious in a design choice, **the motivation being** to synchronize data information throughout a communications network and make Raphaeli more efficient and reliable.

7. **Claims 28 and 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Raphaeli et al** (US Patent No. 6,614,864) and **Lee** (US Patent No. 6,373,861) in

view of **Sudo et al** (US Patent No. **6,714,511**) as applied to Claim 21 above, and further in view of **Vishwanath et al** (US Patent No. **6,418,158**).

The Raphaeli further disclosed said calculating step comprising:

performing a phase compensation operation on said sliding window correlation sum to generate a phase-compensated output (Claim 28) (see col.5 line 10-20: phase correcting); and

performing an operation to generate a calculated output (Claim 29) (see col.19 line 63-col.20 line 12: perform a matched filtering operation. The correlator is adapted to generate an output every sample time).

The **Raphaeli, Lee and Sudo failed to explicitly disclose** receiving said calculated output and generating said frequency offset estimation.

Vishwanath et al disclosed such receiving said calculated output and generating said frequency offset estimation (see Fig.2: blocks 36 and 38 (receiving said calculated output); and see Fig.7: block 116 (generating said frequency estimation))

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to implement such a switch of the **Raphaeli**, as taught by **Vishwanath et al**, so that correct frequency offset estimation can be achieved in OFDM networks, **the motivation being** to maximize reliability and make **Raphaeli et al** more efficient.

Allowable Subject Matter

8. **Claims 18, and 36-39** are allowed.

9. **Claims 3-6, 9-11, 20, 22-27 and 30** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony T Ton whose telephone number is 703-305-8956. The examiner can normally be reached on M-F: 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas W Olms can be reached on 703-305-4703. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ATT 4/8/2004


KENNETH VANDERPLUYE
PRIMARY EXAMINER